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TECHNICAL NOTE

WITCHES' BROOM REVISITED

This note continues the discussion on Yellow Witches' Broom taken up in an earlier technical note (Estabrooks 1986). Observations made on the behavior of this rust disease between 1985 and 1989 led to the following recommendations: (1) that brooms be pruned from primary branches or other branches important for tree uniformity and symmetry, and (2) that infected secondary branches be removed with the broom.

Good Christmas tree culture has always required the removal of witches' broom, but the removal itself may, in some instances, be unnecessarily destructive. When whorl branches are removed, the tree's symmetry may be seriously impaired, thus reducing its quality and value. For this reason broom pruning is sometimes preferable to total removal, which involves cutting off the infected branch.

The unusually high incidence of witches' broom that occurred in a few plantations in the Maritimes in the early to mid-1980s, has, for some reason, declined. Between 1984 and 1988, broom rust destroyed 30-40% of the trees and reduced the quality of most of those remaining in one plantation in Nova Scotia. A broom pruning and weed control program has been ongoing on this site and, although new infections are still being found, the disease is now considered to be under control.

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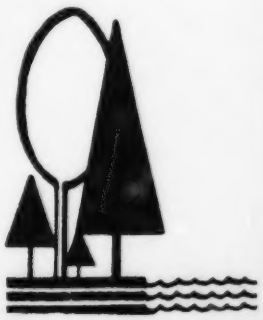

Forestry Canada - Maritimes Region
P.O. Box 4000, Fredericton, N.B. E3B 5P7
P.O. Box 667, Truro, N.S. B2N 5E5
P.O. Box 190, Charlottetown, P.E.I. C1A 7K2

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An example of the behavior of this disease and of the possible variability between sites can be found in two plantations in New Brunswick. Brooms are still being found in one of the plantations (extending over several acres, near Woodstock) where moderate levels of infection first occurred in 1984 on young outplanted seedlings. Over the next two or three years, a few seedlings were lost to the fungus. Since 1985, brooms have been continually pruned from the site and chickweed has been controlled with herbicides. Although new brooms still occur, tree losses are currently nil and the reduction in the quality of the trees is negligible. In the second plantation (near Fredericton), 18% of the 500 trees showed broom symptoms in 1986, whereas 12% had been newly infected the previous year. These brooms were pruned before growth began in 1986. No new infections have been found. Chickweed is not prevalent on this site.

Behavior of the Fungus

The fungus that causes witches' broom enters the tree through opening buds (Ziller 1974). In the Maritimes the fungus appears to establish only on one-year-old shoot growth, apparently after entering through the base of daughter shoots during early stages of elongation. This means that brooms in 1989 with one-year-old shoot growth are established on 1987 branches, two-year-old brooms are on 1986 branches and so on. The first indication of a broom is a swelling with a cluster of buds, seen in the fall on a branch of the previous year's growth. These buds give rise the following growing season to the familiar witches' broom.

A Field Experiment

To gain a better understanding of what the disease does after the broom is pruned from the infected area on the tree, and to determine if broom pruning prevents tree disfugurement, an experiment was begun in 1986 at the plantation near Fredericton.

Each of the 500 trees in the plantation was examined for broom rust and, as infections were found, the age and location of infections on the tree were recorded and all the buds and/or shoot growth were cut off. The fungus was not killed by broom pruning. The swelling of infected areas on branches continued to enlarge with succeeding tree growth, and new shoots - brooms - were produced. Although the fungus remained active, subsequent shoot growth was less vigorous and less profuse than that of the previous brooms. Over the five years of the experiment only two branches were killed by the disease.

Recommendation

Broom pruning is recommended for sanitation as well as cultural purposes. Expectations are that broom pruning, over the long term, will decrease the incidence of infection; however, it can have no effect in the first growing season after pruning.[1]

Since infections establish on one-year-old branches, the young brooms develop under the stimulation of virtually full sunlight. However, as the tree produces new foliage each year, the infection site becomes increasingly shaded. Shade retards growth and is probably the major cause of the weak regrowth that follows broom pruning. This recurring growth is usually stunted and inconsequential to tree form and quality. Furthermore, new tree growth reduces the effects of the disease by obscuring new brooms, or the bare areas that the brooms create on the branches. Those Christmas trees nearing maturity usually become marketable before the occurrence of new brooms.

Although low to moderate levels of infection can be controlled by pruning as described, high rates, where several infections occur on a single tree, may result in tree loss. Treatment carried out in the early stages of broom development provides the best chance of producing a Christmas tree without the visible damage associated with the rust.

Presently there are no known sites supporting more than the usual endemic level of infection, but no one can be sure when other outbreaks may occur. Because the incidence of broom rust is believed to be determined largely by environmental conditions, predictions of future outbreaks or fail-proof recommendations for preventing outbreaks are difficult to make.

At this point only the following recommendations are known practical measures for reducing the spread of this disease and its damage: (1) control chickweed, and (2) remove brooms early in their development (Estabrooks, 1986)

G. Estabrooks
January 1990

[1]Chickweed is the alternate host of Yellow Witches' Broom. Plants are infected in early spring by spores from brooms on balsam fir. The disease survives on chickweed until the following spring when the new plant becomes the source of the innoculum that infects fir.

References:

Estabrooks, G.F. 1986. Witches' broom on balsam fir. Can. For. Serv. MFRC Tech. Note No. 150

Ziller, Wolf. G. 1974. The Tree Rusts of Western Canada. Can. For. Serv. Pacific Forest Research Centre, pp. 154-159.